# SECTION VII.—WEATHER AND DATA FOR THE MONTH.

## THE WEATHER OF THE MONTH.

P. C. DAY, Climatologist and Chief of Division.

[Dated: Weather Bureau, Washington, Mar. 2, 1916.]

### PRESSURE.

The distribution of the mean atmospheric pressure over the United States and Canada and the prevailing direction of the winds are graphically shown on Chart VII, while the average values for the month at the several stations, with the departures from the normal, are shown in Tables I and III.

For the month as a whole the mean barometric pressure was above the normal in the northwest Canadian Provinces and over all districts east of the Rocky Mountains, except southern and western Texas. For all other sections it was below the normal. The positive departures were generally small, except along the Atlantic seaboard from the Carolinas to southern New England and in eastern Montana and the northwestern Canadian Provinces, where they were rather pronounced. The negative departures were quite marked in the central Plateau region, as also in the North Pacific States.

At the beginning of the month relatively low pressure prevailed throughout most sections, except in the South Atlantic States, Arizona, the southern portion of California, and the Canadian Maritime Provinces, where pressure was near or slightly above normal. A succession of rather extensive low and high pressure areas followed each other from the far West to the Atlantic coast during the first week, and after a few days, with the pressure generally near the normal in most sections east of the Rocky Mountains, another succession of low and high areas followed each other with more or less regularity across the country during the greater part of the second and third decades, the movement of these areas being at times quite rapid and again somewhat sluggish.

The pressure in the South Atlantic States was relatively high almost the entire month. For a short time near the end of the first week and again just after the middle of the month it fell to below the normal during the passage of low areas; likewise generally low pressure prevailed throughout the Pacific Coast States until near the end of the month, except for an occasional day or two, when moderate high areas moved in from the Pacific and across a portion of this section.

The month closed with high pressure in the extreme southeastern section and from the Rocky Mountain region westward, while elsewhere it was below the normal.

The distribution of the highs and lows was generally favorable for southerly and southwesterly winds in the New England, the Middle Atlantic, and northern portions of the South Atlantic States, the lower Lake region, and Ohio Valley, southeasterly and easterly in the Gulf region and over the Pacific Coast States, except the southern half of California, and westerly and northwesterly in the upper Lake region, the Missouri and upper Mississippi Valleys. Elsewhere variable winds prevailed.

### TEMPERATURE.

The month opened with temperatures generally above the normal east of the Rocky Mountains, and slightly below to the west. During the following few days there was a general change to colder in the eastern districts and to warmer in the far West, the latter condition moving eastward, however, so that by the 5th moderate winter temperatures had overspread the eastern portion of the country.

Following this the most severe cold wave of the season, to date, appeared in the Northwest, the temperatures falling to −30° at points in the upper Missouri Valley on the morning of the 5th. This cold wave moved rapidly eastward, but diminished in intensity, except along the Canadian border, where at points to the north of Lake Superior the temperatures were as much as −50° F.

For the remainder of the first decade of the month temperature changes were comparatively slight, the weather continuing warm for the season over most southern and eastern districts and considerably colder than normal over the Northwest.

By the 10th, however, high pressure had again appeared in the Canadian Northwest, and colder weather had overspread the northern Plains region. A part of this cold wave moved rapidly eastward along the northern border, but the main area of cold extended southward over the Rocky Mountain and Plains regions, moving thence slowly eastward, but losing energy rapidly on account of warm rains along its front. Under the influence of this cold wave temperatures of −50° occurred near the Montana boundary, zero temperatures extended into northern Texas, and freezing weather occurred over the west Gulf coast.

Following this cold wave temperatures remained below normal over much of the country until about the end of the second decade. The period from the 12th to the 19th was one of marked cold in the far Northwest, where the average temperatures for the period ranged from 15° to 25° below the normal, and it was nearly as persistently cold in portions of the Plains region and upper Mississippi Valley.

At the beginning of the third decade of the month there was a change to much warmer weather over central and eastern districts caused by a succession of low-pressure areas moving from the Pacific coast to the Southern Plains region and thence northeastward to the Great Lakes, in conjunction with high pressure off the southeastern States, thus causing warm southerly winds over much of the country from the Mississippi River east. During this period the temperatures were almost continuously above the average, the excesses ranging from 10 to nearly 20 degrees at points in the Gulf and Atlantic Coast States.

While this unusually warm midwinter weather prevailed in eastern districts cold weather persisted in the West and Northwest. About the 25th a high pressure area of considerable intensity appeared in the Canadian Northwest and rapid falls in temperature occurred throughout the northern Plains region. This cold area increased in severity during the following few days and by the morning of the 27th the temperatures had fallen below −50° F. in northern Montana, but its progress eastward into the central valleys was delayed; persistent low pressure areas moved from the Southwest to the Lake region. During the 26th to 28th some of the lowest temperatures recorded in January were reported from points in the Great Plains and mountain regions of the West, while from the Ohio Valley and lower Lake region east

to the Atlantic some of the highest January temperatures ever known were recorded. Low pressure conditions in the Lake region gradually gave way during the last few days of the month and much colder weather overspread the northern districts to the east, and at the same time warmer weather set in over the Northwest, so that by the close of the month temperatures were approaching the normal over much of the country, although they were still high for the season over the southeastern States and correspondingly low at a few points in the southern Plateau region.

*Extremes.*—The month, as a whole, was marked by unusual ranges in temperature for the different portions of the country, although in individual regions the variations were not excessive. Over the more eastern and southern districts temperatures during the latter part of the month were, in many cases, the highest recorded in January, and from the 20th to the end of the month, especially over portions of the Atlantic Coast States, the temperatures were probably continuously higher than for any similar period in many years. In marked contrast to the East, almost continuous cold prevailed over the Northwest. Minimum temperatures as low as or lower than ever before recorded in January occurred in the Dakotas and Montana, and locally in the mountain districts. The lowest temperature reported during the month, −57° F., occurred at Havre, Mont., where the mean daily departure was −26.8 degrees below normal.

*Monthly averages.*—From southern Arizona northeast to the upper Lakes and thence to the east and south, the mean temperatures were everywhere above the normal, the excesses ranging from +6 to +9 degrees over the greater part of the region. North and west of that line the mean temperatures for the month were nearly everywhere below normal, the month as a whole being the coldest of many years over the Missouri Valley, where the departures ranged from −10 to −25 degrees or more.

## PRECIPITATION.

The low-pressure area over the far Southwest at the close of December moved rapidly northeastward to the Canadian Maritime Provinces during the first few days of January, accompanied by general precipitation, mostly rains, over all districts east of the Rocky Mountains, except the Southeastern States. By the 3d a high-pressure area of great magnitude had covered the country from the Rockies to the Appalachian Mountains, and fair weather obtained in those districts, but at the same time a storm of marked character was moving inland over the north Pacific coast, and precipitation had set in over that region and the northern plateau. During the following day or two this storm moved eastward over northern districts with attendant unsettled weather.

Near the close of the first decade a low-pressure area of great intensity and extent overspread the western portion of the country, and from the 10th to the 13th two well-defined storm areas moved thence eastward, the one passing over the northern border States and the other moving northeastward from New Mexico. During this period precipitation was general over nearly all sections of the country, with heavy rainfall in the lower Ohio and middle Mississippi valleys. A day or so of generally fair weather followed this rain period, but by the morning of the 16th unsettled weather was again the rule, although precipitation was generally light in most districts.

About the 17th a storm of marked character moved inland over southern California, and heavy rains were experienced in that locality. During the succeeding day or two the storm moved slowly eastward over Nevada and Utah, with heavy snowfall at the higher elevations. Excessive rains continued in southern California and adjoining regions, where considerable damage resulted from flood conditions. During the first few days of the third decade the storm area moved eastward, reaching the Canadian Maritime Provinces about the 23d, resulting in general precipitation over the eastern half of the country, the rainfall being unusually heavy in portions of the Lake region, the southern Plains States, the central Mississippi and lower Ohio valleys, and resulting in disastrous floods in portions of northern Illinois. The rainfall was likewise heavy in portions of the Gulf States.

From the 23d to the 25th generally fair weather was the rule in most sections of the country, but about the latter date a low area again appeared in the far Southwest, with a trough-like extension over the great central valleys between two extensive areas of high pressure, one overlying the Atlantic Coast States and adjacent ocean and the other occupying the northwestern districts. During the remainder of the month these high areas persisted in their relative positions, while low-pressure areas followed one another northeastward in succession between them. These pressure distributions marked the last week of the month, with generally cloudy weather and much precipitation, the rainfall being especially heavy in the middle Mississippi and lower portions of the Ohio and Missouri Valleys, where some loss of life and much property damage resulted from severe floods. In the meantime heavy rains had continued in the far Southwest, especially in southern California, which again caused high waters, and much loss of life and property damage occurred in connection with the breaking of a large reservoir in the mountains near San Diego.

The distribution of the precipitation for the month, as a whole, is shown on Chart V. The feature of this distribution is the heavy rainfall in California and over the districts to the south of the Great Lakes from the eastern portion of the Plains region to the Appalachian Mountains. The monthly totals for a considerable portion of this latter region range 8 to 12 inches or higher. They are even greater at the lower elevations of California, where some points had as much as 18 inches of rain during the month. In the Rocky Mountain and Plateau districts the amounts were considerably above the normal, as a rule. In most of the Plains States the precipitation was near the normal, but in the Atlantic coast districts less than the usual amount for the month occurred.

Precipitation accompanying the floods of the month is discussed in some detail on pages 28–38 and illustrated by the map forming A. J. H. figure 2 (XLIV–11).

*Snowfall.*—The snowfall in all sections east of the Rocky Mountains was generally light, except in Minnesota and the Dakotas, where it was above the normal, and some heavy falls occurred toward the end of the month. In the far western mountains unusually heavy falls occurred in most sections, especially in the northern districts of California, and large quantities of snow appeared to be stored in many of the higher mountain regions, with good prospects of a plentiful supply of water for the coming growing season.

## GENERAL SUMMARY.

Over the districts east of the Mississippi the weather was favorable for outdoor occupations, and while the snowfall was generally light, leaving the winter grains and grasses mostly uncovered, they were not subjected to much severe freezing and were generally reported in

good condition. The soil was largely free of frost, and plowing and other farm work was possible for considerable periods.

In the southern trucking regions east of the Mississippi winter crops made good progress on account of the general warmth, and much outdoor work was accomplished.

In Florida citrus and other fruit trees were beginning to bloom, and farther north the buds were being rapidly forced by the continued warm weather.

West of the Mississippi the precipitation was generally heavier than usual, snow and ice covered the ground during much of the month, and there was some apprehension that injury might result to wheat and other winter grains therefrom. Severe cold near the middle of the month extended to the Texas coast, killing much tender vegetation in the trucking regions of that State. In the more northern portions, and generally in the mountains, the snow was heavy and much feeding of stock was necessary.

Some losses and much suffering resulted from the severe cold and long-continued snow covering. In the far Northwest the snow covering greatly benefited the winter wheat, but it necessitated much feeding of stock and greatly interfered with outdoor occupations.

*Average accumulated departures for January, 1916.*

| Districts. | Temperature. | | | Precipitation. | | | Cloudiness. | | Relative humidity. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | General mean for the current month. | Departure for the current month. | Accumulated departure since Jan. 1. | General mean for the current month. | Departure for the current month. | Accumulated departure since Jan. 1. | General mean for the current month. | Departure from the normal. | General mean for the current month. | Departure from the normal. |
| | °F. | °F. | | Ins. | Ins. | | 0–10. | | Perct. | Perct. |
| New England | 29.2 | + 4.8 | | 1.48 | −2.00 | | 6.3 | +0.4 | 75 | − 1 |
| Middle Atlantic | 38.0 | + 6.4 | | 1.70 | −1.50 | | 6.5 | +0.7 | 72 | − 4 |
| South Atlantic | 52.8 | + 7.6 | | 1.62 | −2.30 | | 5.9 | +0.6 | 81 | + 4 |
| Florida Peninsula | 70.9 | + 6.4 | | 1.03 | −1.70 | | 4.0 | +0.8 | 79 | − 2 |
| East Gulf | 54.8 | + 7.5 | | 3.67 | −1.30 | | 6.5 | +0.8 | 81 | + 3 |
| West Gulf | 51.0 | + 4.9 | | 4.81 | +1.80 | | 7.3 | +2.5 | 82 | + 6 |
| Ohio Valley and Tennessee | 39.9 | + 6.7 | | 6.11 | +2.30 | | 7.1 | +0.7 | 78 | + 1 |
| Lower Lakes | 31.4 | + 7.1 | | 2.96 | +0.30 | | 7.6 | +0.2 | 78 | − 3 |
| Upper Lakes | 21.6 | + 3.3 | | 3.27 | +1.20 | | 7.7 | +0.8 | 82 | − 1 |
| North Dakota | −5.9 | −10.0 | | 1.04 | +0.40 | | 5.7 | +0.8 | 87 | + 7 |
| Upper Mississippi Valley | 24.4 | + 2.8 | | 4.45 | +2.80 | | 6.6 | +1.2 | 81 | + 3 |
| Missouri Valley | 18.0 | − 3.1 | | 3.34 | −2.40 | | 5.9 | +0.9 | 82 | + 7 |
| Northern slope | 5.7 | −13.3 | | 1.34 | +0.50 | | 5.6 | +0.5 | 76 | + 6 |
| Middle slope | 26.0 | − 3.1 | | 1.48 | +0.80 | | 6.0 | +1.9 | 76 | + 9 |
| Southern slope | 44.5 | + 3.0 | | 0.45 | −0.20 | | 6.0 | +1.6 | 64 | − 2 |
| Southern Plateau | 39.4 | − 1.3 | | 3.05 | +2.30 | | 4.8 | +1.4 | 62 | +12 |
| Middle Plateau | 24.2 | − 4.2 | | 2.93 | +1.90 | | 7.0 | +1.9 | 80 | +10 |
| Northern Plateau | 19.9 | − 8.9 | | 1.92 | +0.30 | | 7.7 | +1.0 | 78 | − 2 |
| North Pacific | 31.9 | − 7.5 | | 5.74 | −1.00 | | 7.7 | +0.2 | 79 | − 6 |
| Middle Pacific | 43.2 | − 4.1 | | 10.92 | +6.20 | | 7.8 | +2.6 | 86 | + 5 |
| South Pacific | 49.0 | − 1.8 | | 11.06 | +8.30 | | 6.8 | +2.3 | 82 | +10 |

## WEATHER CONDITIONS ON THE NORTH ATLANTIC DURING JANUARY, 1915.

The data presented are for January, 1915, and comparison and study of the same should be in connection with those appearing in the Review for that month. Chart IX (XLIV–9) shows for January, 1915, the averages of pressure, temperature, and the prevailing direction of the wind at Greenwich mean noon, together with the locations and courses of the more severe storms of the month.

For the month as a whole the distribution of the atmospheric pressure over the greater part of the ocean was not far from the normal. On the Meteorological Chart of the North Atlantic for January, showing the normal conditions for that month, a high area surrounded by an isobar of 30.2 inches is central near latitude 28°, longitude 40°, while there is a second high off the coast of Portugal and North Africa, extending as far West as the Madeira Islands. For January, 1915, a high of normal intensity was central near latitude 35°, longitude 26°, while a secondary high with a crest of 30.1 inches extended from the fifty-eighth to ninety-fifth meridians and the thirtieth to forty-seventh parallels. The Icelandic low was of nearly normal intensity and near its usual position, being approximately central at latitude 62°, longitude 7°W.

There was a marked decrease in the number of gales since December, and on the northern trans-Atlantic steamer routes most of them occurred in the first decade of the month. Over the ocean as a whole the number of gales was below the normal for the month of January, although there were some exceptions, as in the 5 degree square between the thirtieth and thirty-fifth parallels and the fiftieth and fifty-fifth meridians, gales were reported on 6 days, a percentage of 19, while the normal for the month is 10.

On Chart III (XLIII–3), showing tracks of low areas for January, 1915, a low (I on Chart IX) is shown that first appeared on the morning of December 31 in northern Saskatchewan. This moved in an approximately southeasterly direction, crossing the Great Lakes, and on the evening of January 2 was central on the Atlantic Coast about 50 miles south of Portland. On the morning of the 3d, the center had moved to latitude 45°, longitude 54°, the barometer having fallen to 28.52 inches, and the wind increased to a velocity of from 65 to 75 miles an hour. The storm log from the steamship *Minnehaha* (Brit.) shows that the lowest barometer reading recorded by that vessel during the storm was 28.46 inches, at 6 a. m. (local time) January 3, the highest velocity of the wind being 90 miles an hour. This disturbance now curved slightly toward the north, the rate of translation being rapid, and on the 4th the center was near latitude 52°, longitude 38°, the barometer having fallen slightly, and the velocity of the wind remaining practically unchanged, as several vessels in the southern quadrant of the area reported westerly winds of from 65 to 75 miles an hour, with snow and hail. The storm then moved toward the north, decreasing in its rate of movement, the pressure and force of wind remaining about the same. It then recurved to the east, and on the 6th was near latitude 55°, longitude 29°, the barometer having risen slightly, the wind retaining its high velocity. On January 7 the center was near Stornoway, Scotland, where the barometer reading was 29.16 inches. There were no reports received from vessels in the immediate vicinity of Stornoway, although near latitude 50°, longitude 20°, winds of gale force were encountered. This storm track was remarkable for the prevalence of unusually heavy winds over a long period, as from January 3 to 6, inclusive, heavy gales of from 75 to 90 miles an hour were reported continuously along the path of the low.

On Chart III (XLIII–3), a second low (II on Chart IX) is shown near Brownsville, Tex., on the morning of January 10. This moved along the coast, accompanied by moderate winds, and on the 12th was central off Hatteras, one vessel near latitude 31°, longitude 65°, reporting a southerly gale of 64 miles. The center moved only a short distance during the next 24 hours, as on the morning of the 13th it was near latitude 37°, longitude 71°, the barometer having fallen to 29 inches; heavy north, northwesterly, and westerly gales prevailing along the coast between Boston and Charleston. From this